

# Notice of Allowability

Application No.

09/872,892

Examiner

Man Phan

Applicant(s)

CHAO ET AL.

Art Unit

2616

## -- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the communications filed 3/9/06.
2. ☒ The allowed claim(s) is/are 10-15, 39, 8-9 and 17-37 (Claims are renumbered as 1-30 respectively).
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All b) ☐ Some\* c) ☐ None of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
  5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
    - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
    - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

### Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. ☐ Information Disclosure Statements (PTO-1449 or PTO/SB/08), Paper No./Mail Date \_\_\_\_\_
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application (PTO-152)
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date \_\_\_\_\_
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☐ Other \_\_\_\_\_

*Reasons for allowance*

1. This communication is in response to applicant's 05/02/2006 communications in the application of Chao et al. for a "Scheduling the dispatch of cells in multistage switches using a hierarchical arbitration scheme for matching non-empty virtual output queues of a module with outgoing links of the module" filed 06/01/2001. This application claims Priority from Provisional Application 60/252,006 filed 11/20/2000 and 60/253,335 filed 11/27/2000. The proposed amendment to the claims and response appear in the Examiner's Amendment. Claims 1-7, 16, 38 have been canceled per applicant's request, and claim 39 has been added. Claims 8, 17-19, 21, 23, 25-28 have been amended as shown in the Examiner's Amendment. The claims have been amended to better point out and more distinctly claim subject matter comprising the invention.

2. Claims 10-15, 39, 8-9 and 17-37 are allowable as evident by applicant's amendment (Claims are renumbered as 1-30 respectively)

3. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. John C. Pokotylo (Reg. No. 36,242) on May 02, 2006.

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4. The application has been amended as follows:

IN THE CLAIMS:

*I) Claims 1-7, 16, 38:* Canceled

*II) Claim 8: (currently amended):* The method of claim 39 + wherein the act of matching the outgoing link of the input module with an outgoing link of one of the central modules includes:

- i) sending a request for the outgoing link of the input module to an arbiter for each of the outgoing links of the central modules that leads towards an output port associated with the virtual output queue matched with the outgoing link of the input module; and
- ii) selecting with the arbiter of each of the outgoing links of the central modules, an outgoing link of an input module from among those that sent a request.

*III) Claim 17 (currently amended):* A combination for use in a multi stage switch, the combination comprising:

- a) a plurality of central modules, each including outgoing links towards output modules including a plurality of output ports, the output modules collectively including k x n output ports;
- b) a plurality of input modules, each including
  - i) k groups of n virtual output queues, and
  - ii) outgoing links coupled with each of the plurality of central modules;

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c) means for matching a non empty virtual output queue of the input module with an outgoing link in the input module, the means for matching a non empty virtual output queue of the input module with an outgoing link in the input module including

i) master arbiters, each of the master arbiters being associated with one of the outgoing links, for selecting a group of virtual output queues from among those associated with a received request,

ii) groups of slave arbiters, each group of slave arbiters being associated with one of the k groups of n virtual output queues, for selecting a virtual output queue from among those submitting a request,

iii) virtual output queue arbiters, each virtual output queue arbiter being associated with one of the virtual output queues, for selecting an outgoing link from among those submitting a grant,

~~The combination of claim 16 wherein the means for matching a non empty virtual output queue of an input module with an outgoing link in the input module further include:~~

iv) means for sending, on behalf of each non empty virtual output queue, a request to slave arbiters, each of the slave arbiters being associated with one of the outgoing links of the input module, and each of the slave arbiters being associated with one of the groups of virtual output queues; and

v) means for sending, on behalf of each of the groups of virtual output queues to which a non empty virtual output queue belongs, a request to master arbiters, each of the master arbiters being associated with one of the outgoing links of the input module; and

d) means for matching the outgoing link of the input module with an outgoing link of one of the central modules.

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**IV) Claim 18 (currently amended):** The combination of claim 17 ~~16~~ wherein the means for matching a non empty virtual output queue of an input module with an outgoing link in the input module performs the match within one cell time slot.

**V) Claim 19 (currently amended):** The combination of claim 17 ~~16~~ wherein each of the master arbiters operates in accordance with a round robin discipline.

**VI) Claim 21 (currently amended):** The combination of claim 17 ~~16~~ wherein each of the slave arbiters operates in accordance with a round robin discipline.

**VII) Claim 23 (currently amended):** The combination of claim 17 ~~16~~ wherein each of the virtual output queue arbiters operates in accordance with a round robin discipline.

**VIII) Claim 25 (currently amended):** The combination of claim 17 ~~16~~ wherein the means for matching a non empty virtual output queue of the input module with an outgoing link in the input module performs multiple matching iterations within one cell time slot.

**IX) Claim 26 (currently amended):** The combination of claim 17 ~~16~~ wherein the means for matching the outgoing link with an outgoing link of one of the central modules include:

i) means for sending a request for the outgoing link of the input module to an arbiter for each of the outgoing links of the central modules that leads towards an output port associated with the virtual output queue matched with the outgoing link of the input module; and

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ii) for each of the outgoing links of the central module, an arbiter for selecting an outgoing link of the input module from among those that sent a request.

**X) Claim 27 (currently amended):** The combination of claim 17 ~~16~~ wherein there are:

k input modules, each having n input ports, k groups of n virtual output queues, and m outgoing links.

**XI) Claim 28 (currently amended):** An input module for use a multi stage switch including a plurality of central modules, the input module comprising:

- a) k groups of n virtual output queues;
- b) outgoing links coupled with each of the plurality of central modules; and
- c) means for matching a non empty virtual output queue of the input module with an outgoing link in the input module, the means for matching a non empty virtual output queue of the input module with an outgoing link in the input module including
  - i) master arbiters, each of the master arbiters being associated with one of the outgoing links, for selecting a group of virtual output queues from among those submitting a request,
  - ii) groups of slave arbiters, each group of slave arbiters being associated with one of the k groups of n virtual output queues, for selecting a virtual output queue from among those submitting a request, and
  - iii) virtual output queue arbiters, each virtual output queue arbiter being associated with one of the virtual output queues, for selecting an outgoing link from among those associated with a received grant,

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iv) means for sending, on behalf of each non empty virtual output queue, a request to slave arbiters, each of the slave arbiters being associated with one of the outgoing links of the input module, and each of the slave arbiters being associated with one of the groups of virtual output queues, and

v) means for sending, on behalf of each of the groups of virtual output queues to which a non empty virtual output queue belongs, a request to master arbiters, each of the master arbiters being associated with one of the outgoing links of the input module.

***XII) Claims 39 (new):*** The method of claim 10 further comprising matching the outgoing link of the input module with an outgoing link of one of the central modules.

5. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

6. The following is an examiner's statement of reasons for allowance: The instant application is deemed to be directed to a nonobvious improvement over the invention patented in closest prior arts of record. The improvement comprises the combination for use in a multi stage switch, the combination comprising: a) a plurality of central modules, each including outgoing links towards output modules including a plurality of output ports, the output modules collectively including  $k \times n$  output ports; b) a plurality of input modules, each including i)  $k$

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groups of  $n$  virtual output queues, and ii) outgoing links coupled with each of the plurality of central modules; c) means for matching a non empty virtual output queue of the input module with an outgoing link in the input module, the means for matching a non empty virtual output queue of the input module with an outgoing link in the input module including i) master arbiters, each of the master arbiters being associated with one of the outgoing links, for selecting a group of virtual output queues from among those associated with a received request, ii) groups of slave arbiters, each group of slave arbiters being associated with one of the  $k$  groups of  $n$  virtual output queues, for selecting a virtual output queue from among those submitting a request, iii) virtual output queue arbiters, each virtual output queue arbiter being associated with one of the virtual output queues, for selecting an outgoing link from among those submitting a grant, iv) means for sending, on behalf of each non empty virtual output queue, a request to slave arbiters, each of the slave arbiters being associated with one of the outgoing links of the input module, and each of the slave arbiters being associated with one of the groups of virtual output queues, and v) means for sending, on behalf of each of the groups of virtual output queues to which a non empty virtual output queue belongs, a request to master arbiters, each of the master arbiters being associated with one of the outgoing links of the input module; and d) means for matching the outgoing link of the input module with an outgoing link of one of the central modules, as recited in the claims.

7. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue



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fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

8 Any inquiry concerning this communication or earlier communications from the examiner should be directed to Man U. Phan whose telephone number is (571) 272-3149. The examiner can normally be reached Monday through Friday from 6:00 am to 3:30 pm.

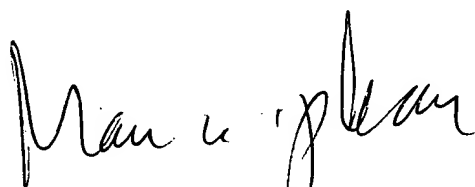
9. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wellington Chin, can be reached on (571) 272-3134. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (571) 272-2600.

10. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. should you have any questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at toll free 1-866-217-9197.

MPhan

05/05/2006



MAN U. PHAN  
PRIMARY EXAMINER